1.0 INTRODUCTION

This report presents the results of the excavation and removal of polychlorinated biphenlys (PCBs) contaminated soil at the Large Sewage Treatment Ponds area located at Sierra Army Depot (SIAD) in Herlong, California (see Appendix 1, Figures 1 & 2). The work completed under contract No. DACA05-97-D-0014 task order 01 was completed in accordance with CAL INC's *Sampling and Analysis Plan (SAP), Sierra Army Depot* dated August 25, 1997. The overall purpose of the project was to characterize soil at the northern unlined sewage pond and the soil mound, excavate and dispose of contaminated PCB soil, and obtaining site closure from the Department Of Toxics Substance Control (DTSC) and the Regional Water Quality Control Board (RWQCB).

The scope of work for the project was based on the CAL INC's SAP referenced above. In general, the scope of work included the following major tasks:

- collecting composite soil samples at the base of the northern unlined sewage pond;
- collecting composite soil samples from the soil mound;
- surveying the location of soil samples from the northern unlined sewage pond and soil mound;
- analyzing soil samples at a state certified laboratory for PCBs and other constituents necessary to evaluate disposal options;
- validating laboratory data;
- profiling, transporting, and disposing of the soil mound; and
- collecting confirmation soil samples beneath the soil mound

2.0 SITE DESCRIPTION AND BACKGROUND

SIAD is an active military facility located in Herlong, Lassen County, California, approximately 4 miles west of the California/Nevada border and 5 miles east of US Highway 395 (see Appendix 1, Figure 1). The Large Sewage Treatment Ponds are located in the south-central portion of the Main Depot. The site contains four unlined ponds (see Figure 3). The four unlined ponds occupy an area approximately 360,000 square feet. In addition, there are two polyethylene-lined ponds adjacent to the site, which occupies a surface of approximately 500,000 square feet. The unlined ponds were used for sewage treatment from 1941 to 1971. The polyethylene-lined ponds were constructed to replace the unlined ponds. According to Harding Lawson Asscociates (HLA, 1994), the unlined ponds received overflow from the lined ponds during wet times of the year. In addition, the use of the unlined ponds for overflow appeared to have ceased in May 1992.

In August 1992, Harding Lawson Associates (HLA) conducted a subsurface investigation at the subject site. The investigation consisted of collecting seven soil composite samples from the unlined pond, drilling three soil borings and installing one monitoring well (HLA, 1994). The composite samples were analyzed for Title 22 metals, semivolatiles, and nitrate plus nitrite (as nitrogen). Summary of soil analytical data can be found in HLA "*Total Environmental Program Support, Final Remedial Investigation*" (HLA, June 27, 1994).

Three soil borings (STP-1-SB through STP-3-SB) were drilled at the center of the unlined ponds and two hand augered soil boring (STP-4-SB and STP-5-SB) were drilled in a soil mound. According to HLA, the soil mound consists of sediment that was removed from the unlined ponds. The soil borings were drilled to a depth of approximately 35 feet below ground surface (bgs) and the hand augered borings were drilled to approximately 9 feet bgs. Soil samples collected from the soil boring were analyzed for organics, Title 22 metals, and nitrate plus nitrite (as nitrogen). In addition, hand augered soil samples were analyzed for pesticides/polychlorinated biphenyls (PCBs) and hexavalent chromium. Summary of soil analytical data can be found in HLA "*Total Environmental Program Support, Final Remedial Investigation*" (HLA, June 27, 1994).

During the investigation one monitoring well (STP-2-MW) was installed at the site. The monitoring well was drilled to a depth of approximately 57 feet bgs. Groundwater samples were collected from the monitoring well and were analyzed for metals, organics, nitrates and macro-parameters. Summary of groundwater analytical data can be found in HLA "*Total Environmental Program Support, Final Remedial Investigation*" (HLA, June 27, 1994).

In February 1993, HLA observed the installation of three piezometers (STP-3-PZ through STP-5-PZ). The purpose of the piezometers was to further evaluate the groundwater flow direction at the site (HLA, June 27, 1994). The piezometers were drilled to a depth ranging from 55 feet bgs to 89 feet bgs. In October 1994, HLA observed the installation of three additional piezometers (STP-6-PZ through STP-8-PZ). The piezometers were drilled to a depth ranging from 52 to 64 feet bgs.

Based on the results of previous sampling events performed by HLA and Montgomery Watson, groundwater monitoring data is summarized as follows:

- Groundwater samples analyses indicated concentrations of TDS, sulfate, and manganese exceed secondary federal and state MCLs. The concentration of these analytes in groundwater samples may be representative of naturally occuring conditions. Nitrate/Nitrite concentrations in three groundwater samples from two sample events slightly exceed federal or state MCLs.

- Pesticides including DDT, BHC, alpha endosulfan, dieldrin, heptachlor poxide, and isodrin were detected in samples collected during the 1992 sampling rounds. These compounds were not detected during subsequent 1994 and 1995 sampling events.

- Organic compounds detected in groundwater collected during 1994 and 1995 sample events include chloroform and the TICs caprolactum and hexadecanioc acid and are likely to be laboratory artifacts.

- TCE was detected in two piezometers during one sampling event at low concentrations. However based on subsequent sampling events, TCE was below laboratory detection limits in the two piezometers.

- The local groundwater potentiometric surface beneath the ponds was identified as a mound.

3.0 REGULATORY INVOLVEMENT

In the State of California, sewage ponds are regulated by the DTSC and the RWQCB. The project is located within the Lahontan Region of the RWQCB. The contact persons at the RWQCB and DTSC are listed below.

Kevin Kratzke
Regional Water Quality Control Board
2501 Lake Tahoe Blvd
South Lake Tahoe, California 96150
916-542-5421

John Harris
Department of Toxics Substance Control
10151 Croydon Way, Suite 3
Sacramento, California 95827
916-225-3683

4.0 FIELD ACTIVITIES

This section presents a description of the field activities conducted at the Large Sewage Treatment Ponds in conjunction with the soil remediation project. The field activities were conducted during the period of September 19, 1997 through March 4, 1998. In general, the field activities consisted of the following tasks:

- collecting composite soil samples at the base of the northern unlined sewage pond;
- collecting composite soil samples from the soil mound;
- surveying the location of soil samples from the northern unlined sewage pond and soil mound;
- analyzing soil samples at a state certified laboratory for PCBs and other constituents necessary to evaluate disposal options;
- validating laboratory data;
- profiling, transporting, and disposing of the soil mound; and
- collecting confirmation soil samples beneath the soil mound

A summary of the personnel and equipment utilized during the project, a description of the actual versus planned scope of work, and descriptions of each site task are presented in the following sections.

4.1 Personnel, Equipment, and Documentation

4.1.1 Personnel

All work involved in the project was conducted under the supervision of CAL INC. In general,

the following key personnel were involved with the project:

PROJECT PERSONNEL LARGE SEWAGE TREATMENT PONDS SIERRA ARMY DEPOT		
Personnel	**Company**	**Responsibility**
Les Schmitner	US Army Corps of Engineers	Contracting Officer Representative
Joseph Krohn	CAL INC	Program Manager
Claudio Avila	CAL INC	Project Supervisor
Peter Fracchia	Centerline Corp, Inc.	Excavation Contractor

4.1.2 Equipment

Centerline Corporation, Inc., of Alamo, California provided equipment used during the excavation work. Earthworking equipment included a front-end loader for loading contaminated soil. Transportation and disposal of the contaminated soil was accomplished using 18 cubic yard transfer trucks.

4.1.3 Field Documentation

All field activities were entered into daily field logs. The logs were used to describe daily field activities and sampling, and to note deficiencies in quality control/quality assurance (QC/QA). Daily field logs are attached in Appendix 2.

4.2 Deviations from Sampling Analyses Plan

Deviations in the planned actual scope of work versus the final scope of work included the following major items:

- additional laboratory analyses were required to profile the soil mound; and
- based on laboratory results, the soil mound was classified as a non-RCRA hazardous waste, and therefore was disposed at Class I Landfill.

The initial volume of the soil mound was originally estimated to be approximately 325 tons, as specified in the project specification. However, based on the amount of soil removed and transported to the Class I Landfill, a total of 143.53 tons of soil were generated during the removal of the soil mound.

4.3 Northern Unlined Sewage Ponds

On September 19, 1997 CAL INC collected twenty soil composite samples from the northern unlined sewage pond. The purpose of the soil samples was to evaluate the presence of PCBs (Aroclor 1260) in the northern unlined sewage pond. Soil samples were collected approximately 6-inches below ground surface (bgs). The location of the soil samples are shown on Figure 4. A licensed surveyor surveyed the location of the soil samples and the limits of the unlined sewage

ponds. A copy of the survey map is presented in Appendix 3. Site photographs were taken during field activities and are presented in Appendix 4.

4.4 Soil Mound

The removal of the soil mound was completed in two phases. On September 19 and October 16 and December 12, 1997, CAL INC collected composite soil samples from the soil mound to evaluate disposal options. The second phase was completed on March 4, 1998. The second phase consisted of removing, transporting and disposing of the soil mound to a Class I landfill and collecting confirmation soil samples beneath the soil mound.

During the first phase, soil samples were collected approximately 6-inches below ground surface (bgs). The location of the soil samples are shown on Figure 5. A licensed surveyor surveyed the location of the soil samples and the limits of the soil mound. A copy of the survey map is presented in Appendix 3. Site photographs were taken during field activities and are presented in Appendix 4.

The second phase of work was performed on March 3 and March 4, 1998. CAL INC observed the removal of the soil mound. The soil mound was removed to approximately 6 inches below existing grade and covered a surface area of 1350 square feet. The limits of the excavations are shown on Figure 6. Cross sectional views of the soil mound prior to the removal and after the removal are shown on Figure 7. Site photographs were taken during field activities and are presented in Appendix 4.

Confirmation soil samples were collected approximately 6-inches below ground surface (bgs). The location of the soil samples are shown on Figure 6. A licensed surveyor surveyed the location of the soil samples and the limits of the soil mound. A copy of the survey map is presented in Appendix 3. Site photographs were taken during field activities and are presented in Appendix 4.

4.5 Soil Sampling and Decontamination

This section presents a discussion of the sampling procedures and methodologies, which were utilized for the project. The sampling program consisted of the collection of composite soil samples from the northern unlined sewage treatment pond and soil mound, and collection of confirmation soil samples beneath the soil mound. Table 1 (see Appendix 5) presents the number and location of the soil samples collected, and analyses performed during the investigation.

4.5.1 Composite Soil Samples

Twenty soil compsite soil samples [COMP STP (1-5)-1 through COMP STP (96-100)-20] were collected from the northern unlined sewage treatment pond. Each soil composite consisted of five discrete soil samples. The five discrete soil samples were composited to one sample by the laboratory. The locations of the soil samples are shown on Figure 4. All soil samples were collected from approximately 6-inches below ground surface (bgs) and were placed in glass jars. The samples were sealed with a Teflon® lid and labeled with project, sample designation, and

sampling date. The samples were placed in an ice chest and logged on chain-of-custody documentation.

Three sets of soil composite soil samples [COMP SM1-(1-4) through COMP SM3-(1-4)] were collected from the soil mound. Each soil composite consisted of four discrete soil samples. The four discrete soil samples were composited to one sample by the laboratory. The locations of the soil samples are shown on Figure 4. The locations of the soil samples are shown on Figure 5. All soil samples were collected from approximately 6-inches bgs and were placed in glass jars. The samples were sealed with a Teflon® lid and labeled with project, sample designation, and sampling date. The samples were placed in an ice chest and logged on chain-of-custody documentation, using the soil sampling procedure described in the previous section.

4.5.2 Confirmation Soil Samples

After the removal of the soil mound and in accordance with the approved SAP, six confirmation soil samples (SC1 through SC6) were collected from the base of the former soil mound. Soil samples were collected as described in section 4.5.1. The locations of the soil samples are shown on Figure 6.

4.5.3 Equipment Decontamination

A decontamination area was set up away from the immediate zone of the investigation. All reusable sampling equipment and tools were decontaminated between sampling events using a phosphate free detergent and water solution wash, a tap water rinse and de-ionized water rinse.

5.0 RESULTS OF CHEMICAL ANALYSES

This section presents the results of chemical analyses on soil samples collected during the project. Analytical results of soil samples are presented in Table 2 through 4 (see Appendix 5). Certified laboratory reports are presented in Appendix 6.

5.1 Applied Action Levels

Applied action level was used for this project for determining an acceptable residual contaminant level in the northern unlined sewage treatment pond and soil mound. The applied action level was developed based on negotiations between the US Army Corps of Engineers and DTSC and was derived from the USEPA Region 9, Preliminary Remedaition Goal for PCBs in industrial soil. The applied action level for PCB–1260 was designated at 0.34 mg/kg (PCB–1260). Soil containing concentrations greater than 0.34 mg/kg were to be removed, transported and disposed off site at an appropriate landfill facility.

5.2 Stockpiled Soil Samples

The twenty soil composite soil samples and the three soil composite soil samples were analyzed by Curtis and Tompkins (C&T) located in Berkeley, California. Soil samples were analyzed for PCBs using EPA Method 3350/8080. In addition, soil samples collected from the soil mound

were analyzed for Title 22 CAM 17 metals using EPA Method 6010A/7470, volatile organics using EPA 8260, Waste Extraction Test (WET) with de-ionized water for lead and mercury using EPA 6010A/7470, WET Leachate for lead and mercury using EPA 6010A/7470, Toxixcity Characteristic leaching Procedure (TCLP) for arsenic, barium, cadmium, chromium, lead and mercury using EPA 6010A/7470 and Fecal Coliform. C&T is certified by the California Department of Health Services and the US Army Corps Of Engineers Missouri River Division (MRD) for all of the analytical methods used for the project, except for fecal coliform. The US Army Corps of Engineers does not validate laboratory analyses for fecal coliform. Summaries of results are presented in Table 2 through Table 4. Certified laboratory reports are presented in Appendix 6.

5.3 Confirmation Soil Samples

Confirmation soil samples collected beneath the former soil mound were analyzed by C&T for PCBs using EPA Method 8080 and Tittle 22 CAM 17 Metals. Summaries of the analytical results of soil samples are presented in Table 3. Certified laboratory reports are presented in Appendix 6.

5.4 Discussion of Soil Analytical Results

Based on analytical results of soil samples collected from the northern unlined sewage pond, PCBs-1260 were below laboratory detection limits and the applied action level. However, PCBs-1254 were detected in soil samples at concentrations ranging from below laboratory detection limits to 0.11 milligrams per kilogram. PCBs-1254 concentrations were below the action levels. Analytical results of soil samples are presented in Table 2.

Based on analytical results of composite soil samples collected from the soil mound, PCBs-1260 concentrations were below laboratory detection limits the action level. However, PCBs-1254 concentrations were detected in soil samples at concentrations ranging from 0.160 mg/Kg to 0.400 mg/Kg. Based on the results of the CAM 17 metals, additional laboratory analyses were required to profile the soil to evaluate disposal options. Based on the results of the additional laboratory analyses the soil mound was classified as a non-RCRA hazardous waste. Analytical results of soil samples PCB's and the additional laboratory analyses are presented in Table 3 and Table 4.

PCB's 1260 concentrations were below laboratory detection limits in confirmation soil samples collected beneath the soil mound. Analytical results of soil samples are presented in Table 3

6.0 QUALITY CONTROL AND OVERALL DATA QUALITY

Field sampling activities were performed under the supervision of the Contractor Quality Control System Manager. All field activities were conducted in accordance with the approved program level Chemical Data Quality Management Plan (CDQMP) (CAL INC, 1997), and the site-specific SAP. Although laboratory QA/QC and data validation was provided for all analyses for this project, based on the approved SAP, laboratory QA/QC was not required for composite soil samples used to evaluate disposal options (i.e. additional soil mound soil composite samples). In

summary, the following section provides the results of the data validation for samples collected from the northern unlined sewage ponds, soil mound sample (analyzed for PCB and CAM 17 metals), and confirmation soil samples collected beneath the soil mound.

Chemical data generated for this project were reviewed by a qualified chemist in accordance with the procedures outlined in USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA 1994a) and USEPA Contract Laboratory Program National Guidelines for Inorganic Data Review (EPA 1994b). Sample results and associated QA/QC results that were reviewed included (as applicable): holding times, initial and continuing calibration, field and laboratory blank results, laboratory control sample (LCS), spike results, matrix spike (MS) results, field and laboratory matrix duplicates results, surrogate recoveries, and internal standard performance. All analytical data summaries and data review worksheets are provided in Appendix 7. Overall quality of the chemical data is discussed below.

Project specific samples were analyzed within required holding times. Initial and continuing calibrations were acceptable. All method blank results were below reporting limits. The appropriate number of sample-specific analyses were performed. A discussion of the overall data quality is presented below.

6.1.1 Accuracy

Accuracy assesses how close an experimental value is to the true or reference value. Primary indicators of accuracy are recoveries of surrogate spikes, LCS spikes, and MS.

Surrogate spike, LCS spike, and MS recoveries for PCBs and CAM 17 metals analyses were generally good, indicating that these analytical methods were consistently accurate. No data qualifiers were applied to the analytical results.

6.1.2 Precision

Precision is a measure of the reproducibility of an experimental value without regard to the true or reference value. Primary indicators of precision are sample/sample duplicate, MS/MSD, and field duplicates.

MS/MSD were analyzed at the appropriate frequency for the project specific samples. No data qualifiers were applied to the analytical results.

6.1.3 Completeness

Chemical data for this project has an estimated completeness of 100 percent. This level of completeness is considered very high and is an indication of high quality data. The overall project completeness goal was met and exceeded. A table summarizing the overall completeness is presented in Table 5.

6.1.4 Comparability

Comparability is a qualitative assessment of how well one data set compares to another. Important determinants of comparability include uniformity of sampling activities, analytical procedures, data reporting, and data review. These have been very consistent during this project. Use of specific EPA analyses and standardized process of data review have lent a high degree of comparability to the data.

6.1.5 Representativeness

Representativeness refers to how well sample data accurately reflects true environmental conditions. Determinants of representativeness include sampling locations, frequency, collection procedures, and compromises to sample integrity (for example, cross contamination) that occur during collection, transport, and analysis. Selection of representative sampling locations is important to ensure that the medium sampled is typical of the site. Correct sample collection, transport, and analytical procedures are important to ensure that samples analyzed closely resemble the medium samples and to minimize field/laboratory contamination.

Sampling locations, frequency, and collection protocols were described in the SAP. These protocols followed standard accepted methods for site characterization. All aspects of the sampling and analytical program were approved by regulatory agencies. Thus, with respect to accepted site characterization approaches, existing guidance, and regulatory compliance, the sampling and analytical program met all relevant requirements for data representativeness.

6.1.6 Sensitivity

Method reporting levels specified in the CDQMP were met for PCB analyses and CAM 17 metals. No data qualifiers were applied to the analytical results.

6.1.7 Conclusions

No or very few qualifiers (J) were applied to the chemical data for this project. No significant problems occurred in the analysis of samples that would compromise the data quality. Based on the QC data provided, the chemical data are considered valid and are usable for the purpose intended.

7.0 TRANSPORTATION AND DISPOSAL OF CONTAMINATED SOILS

The soil mound was profiled, transported, and disposed off-site. A total of 143.53 tons of soil was transported to Chemical Waste Management, Inc in Kettleman City, California. The contaminated soil was loaded into awaiting 18 cubic yard transfer trucks. Loading, transporting and disposal activities were conducted on March 3 and March 4, 1998. Copies of the hazardous waste manifests and landfill weight tickets are provided in Appendix 8.

8.0 SUMMARY AND RECOMMENDATIONS

Based on the results of the investigation conducted at the site, the following summary and recommendations are provided.

8.1 Summary

1. Twenty soil samples were collected from the northern unlined sewage pond to evaluate for PCBs and disposal options. Based on analytical results of soil sample collected from the unlined sewage pond, PCB were below the action level (0.34 mg/Kg).

2. Three sets of soil composite samples were collected from the soil mound to evaluate for PCBs and disposal options if necessary. Based on analytical results of soil samples collected from the soil mound, the soil mound was classified as non-RCRA hazardous waste and required offsite disposal. A total of 143.53 tons of soil were excavated, transported and recycled at Chem Waste Management located in Kettleman City, California.

3. Six confirmation soil samples were collected beneath the soil mound. Based on confirmation soil samples collected beneath the former soil mound PCB concentrations were below laboratory detection limits.

8.2 Recommendations

Based on the results of the soil remediation and testing activities conducted during the investigation, "no further action" appears to be warranted for the unlined sewage pond and beneath the former soil mound. Closure should be requested from the RWQCB and DTSC.

9.0 REFERENCES

CAL INC. August 25 1997. Sampling and Analysis Plan, Large Sewage Ponds Area and Building 1003. Sierra Army Depot, Herlong, California.

Environmental Protection Agency (EPA), 1994a, USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review.

EPA, February 1994b, USEPA Contract Laboratory Program, National Functional Guidelines for Inorganic Data Review.

Harding Lawson Associates (HLA) and Montgomery Watson (MW), October1996, Record of Decision, Remedial Action Plan (ROD/RAP), Nine Sites, Final, Sierra Army Depot, prepared for USACE.

State of California Regional Water Quality Control Board (RWQCB). August 10, 1990. Tri-Regional Board Staff Recommendations for Preliminary Investigation and Evaluation of Underground Tank Sites.

10.0 LIMITATIONS

The services described in this report were performed consistent with general accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our clients unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, location, time frames and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices. or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of report.